

Effect of Reserpine on the Noradrenaline and Adrenaline Content of the Adrenal Gland in the Toad

Masayoshi KAMO*

*Department of Physiology, Nagasaki University
School of Medicine, Nagasaki, Japan*

Received for publication February 10, 1962

Differential estimation of the noradrenaline and adrenaline content of the adrenal gland in toads was made by using the method of SUZUKI and OZAKI. Reserpine was injected subcutaneously in a dose of 10 mg/kg. Twenty hours after reserpine injection the noradrenaline content of the adrenal gland decreased definitely, while there was no change in the adrenaline content. Forty hours after reserpine an increase in the adrenaline content and a marked depletion of noradrenaline were observed.

It is well established that reserpine causes depletions of noradrenaline and adrenaline of the mammalian adrenal gland. The question might therefore be asked whether this is the case in the adrenal gland of the cold-blooded animals. The present investigation was undertaken to evaluate the effect of reserpine on the noradrenaline and adrenaline content of the adrenal gland in the toad.

EXPERIMENTAL METHODS

Toads of both sexes were used in experiments. The adrenal gland was extirpated together with the kidney. Renal tissue was then cut off from the adrenal gland as completely as possible. The adrenal gland was extracted with 4% trichloroacetic acid and analyzed for noradrenaline and adrenaline by using the colorimetric method of SUZUKI and OZAKI⁴⁾. Synthetic L-adrenaline (Merck) and DL-noradrenaline (Sankyo) were used as the reference standards.

Forty toads were injected with reserpine in a dose of 10 mg per kg body weight. Reserpine (Ciba), dissolved in 1:1:2 mixture of ethanol, propylenglycol and distilled water, was given subcutaneously. The toads were divided into 4 groups of 10 each. In *group 1*, the adrenal glands were extirpated 5 hours after injection. In *groups 2, 3, and 4*, extirpations of the glands were made 10, 20, and 40 hours after injection, respectively. Control experiments were made on 40 toads not given reserpine.

* 加 茂 正 嘉

RESULTS

The summarized data are given in Table 1.

Five, 10, and 20 hours after reserpine injection there were no significant alterations of the adrenaline content of the adrenal gland.

Table 1.

Effect of Reserpine on the Noradrenaline and Adrenaline Content of the Adrenal Gland in the Toad

No. of toads	Hours after reserpine injection	Noradrenaline and adrenaline content (mg/kg of body wt.) mean \pm standard error of the mean		Per cent noradrenaline mean \pm standard error of the mean
		Noradrenaline	Adrenaline	
40	Control	0.108 \pm 0.0027	0.134 \pm 0.0025	42 \pm 0.47
10	5	0.087 \pm 0.0038	0.122 \pm 0.0064	42 \pm 1.1
10	10	0.080 \pm 0.0028	0.131 \pm 0.0039	38 \pm 0.85
10	20	0.068 \pm 0.0030	0.135 \pm 0.0038	32 \pm 0.92
10	40	0.049 \pm 0.0026	0.169 \pm 0.0070	22 \pm 0.33

After 40 hours, however, the adrenaline content was found to increase significantly ($P < .001$). As to the noradrenaline content of the adrenal gland, a definite depletion was found 20 and 40 hours after injection ($P < .001$).

The relative noradrenaline content, i.e., the percentage of noradrenaline content to the total catecholamine content, was on the average 42 percent in the control group. Five hours after reserpine it was unaltered. After 20 and 40 hours it was 32 and 22 percent, respectively. Differences between these values and the control one were statistically highly significant ($P < .001$).

DISCUSSION

In the present study a selective noradrenaline depletion of the toad adrenal gland was found to be induced by reserpine injection. No adrenaline depletion was observed after reserpine injection.

HOLZBAUER and VOGT²⁾ demonstrated that in cats a single injection of 0.4 mg/kg reserpine caused a decrease in noradrenaline and adrenaline content of the innervated adrenal gland, but not of the denervated one.

Similar results were obtained in experiments on mice by ERÄNKÖ and HOPSU¹⁾. By a single injection of 1 mg reserpine a loss of both noradrenaline and adrenaline was produced. On the other hand, they observed in rats a definite and selective loss of noradrenaline, but not

of adrenaline, of the adrenal gland caused by a single injection of 0.25–0.5 mg reserpine.

The effect of reserpine on the noradrenaline and adrenaline content of the adrenal gland in the rabbit, cat, rat, and mouse was studied by KRONEBERG and SCHÜMANN³⁾. In rabbits noradrenaline was not found in the adrenal gland before and after reserpine injection. The adrenaline content was reduced markedly by a single injection of 0.1–4 mg/kg reserpine. In cats, injected with 0.4–3 mg/kg reserpine, there was a decrease in noradrenaline and adrenaline content of the adrenal gland, the relative noradrenaline content being unchanged. In rats and mice the adrenal catecholamine depletion was observed after injection of 10 mg/kg reserpine. The percentage of noradrenaline was in these animals always decreased in contrast with the cat.

Thus it was elucidated that the rat and toad adrenals responded to reserpine in the same way, while they did in a different way from the cat adrenals.

ACKNOWLEDGMENT. The author expresses appreciation to Professor T. SUZUKI for advice and criticism. The author is also very grateful to Messrs. Ciba Products Ltd. for a generous supply of "Reserpine" and to Sankyo Co. Ltd. for "Noradrenaline."

REFERENCES

- 1) ERÄNKÖ, O. AND HOPPU, V. : *Endocrinology* 62 : 15. (1958).
- 2) HÖLZBAUER, M. AND VOGT, M. : *J. Neurochem.* 1 : 8. (1956).
- 3) KRONEBERG, G. AND SCHÜMANN, H. J. : *Arch. exp. Path. Pharmacol.* 231 : 349. (1957).
- 4) SUZUKI, T. AND OZAKI, T. : *Tohoku J. Exper. Med.* 54 : 332. (1951) ; OZAKI, T. : *ibid.* : 61 : 83. (1954).